Cost Assessment of Water Resources Degradation (CAWRD) of the Litani Basin
Cost of Remediation
Consultation Meeting

Fadi Doumani

Beirut, December 12, 2013

Presentation Content

- Objective
- Criteria for the Analysis
- Results of the CAWRD
- Framework for the Analysis
- Aggregated Results
- Water: Potable Water and Sanitation
- Water Technical Losses
- Upper Litani Basin Depollution
- Final Note: Comparison by Basin

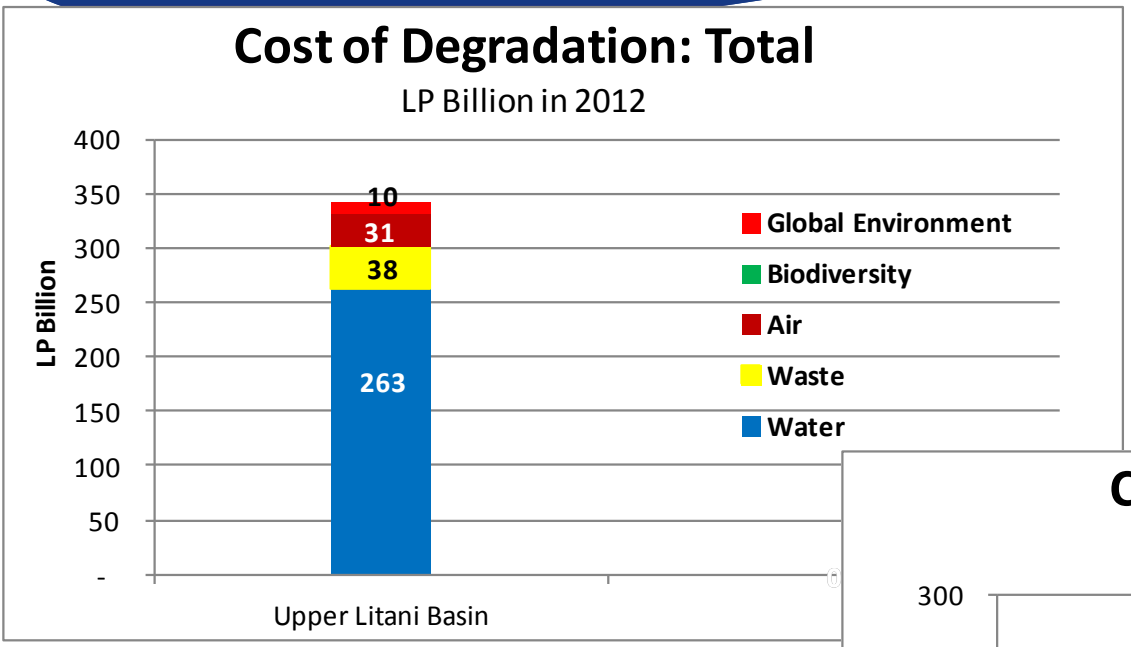
Remediation Cost: Objective

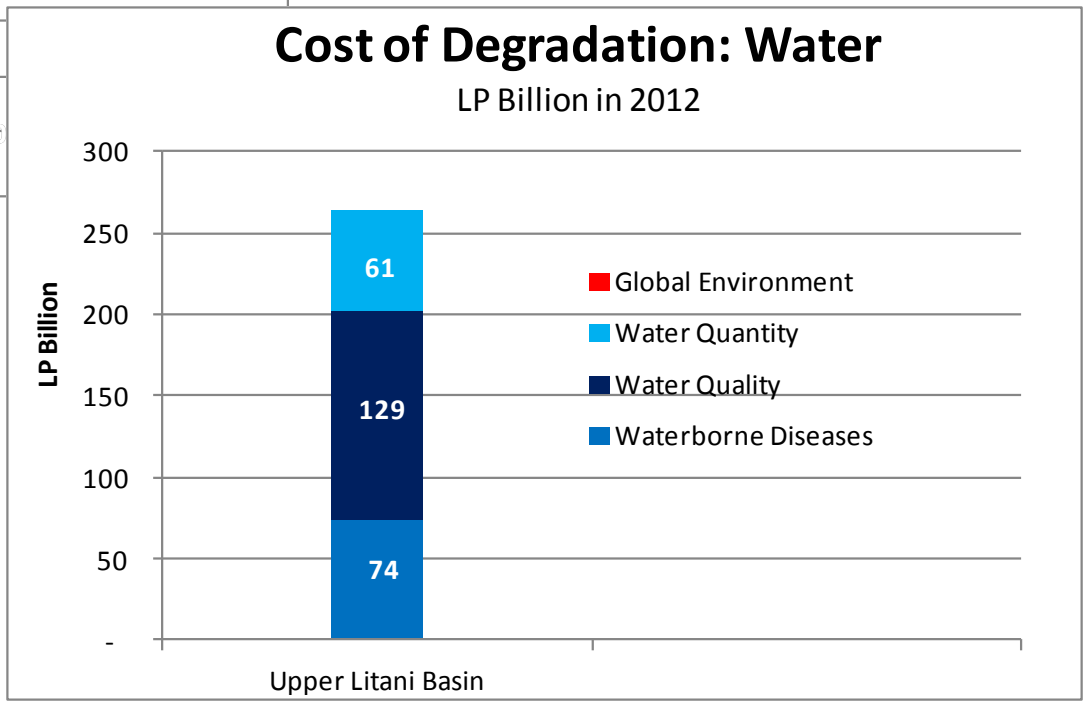
- The objective of the Remediation Cost (RC) is to select some interventions that would reduce environmental damage in the most efficient manner.
  For this, the cost/benefit analysis (CBA) method is used.
  The CBA allows to present the decision-maker/investor with a number of efficient choices by bringing the costs of degradation and investments of a project to a common denominator in order to prioritize interventions.

Remediation Cost: Criteria for Analysis

- Three indicators are taken into account in analyzing the CBA to determine the profitability of the project:
- The net present value (NPV) is the difference between benefits and total discounted costs;
- The internal rate of return (IRR) is the discount rate that resets the NPV or the interest rate that makes the NPV of all cash flows equal to zero, and
- The present value B/C ratio, which is the ratio of the present value of benefits over the present value of costs over the life of the project must be equal or greater than 1.
- Investments over 20 years

DC: Results


Cost of Degradation: Total
LP Billion in 2012
LP Billion
400
350
300
250
200
150
100
50
-
10
31
38
263
Global Environment
Biodiversity
Air
Waste
Water
Upper Litani Basin


Cost of Degradation: Water
LP Billion in 2012
LP Billion
300
250
200
150
100
50
-
61
129
74
Global Environment
Water Quantity
Water Quality
Waterborne Diseases
Upper Litani Basin

Remediation Cost: Framework for the Analysis

Three intervention scenarios were considered:

- Water and Sanitation in rural areas;
- Water network efficiency; and
- Depollution of the Upper Litani River.

Remediation Cost: Aggregated Results

The most efficient scenarios were retained:

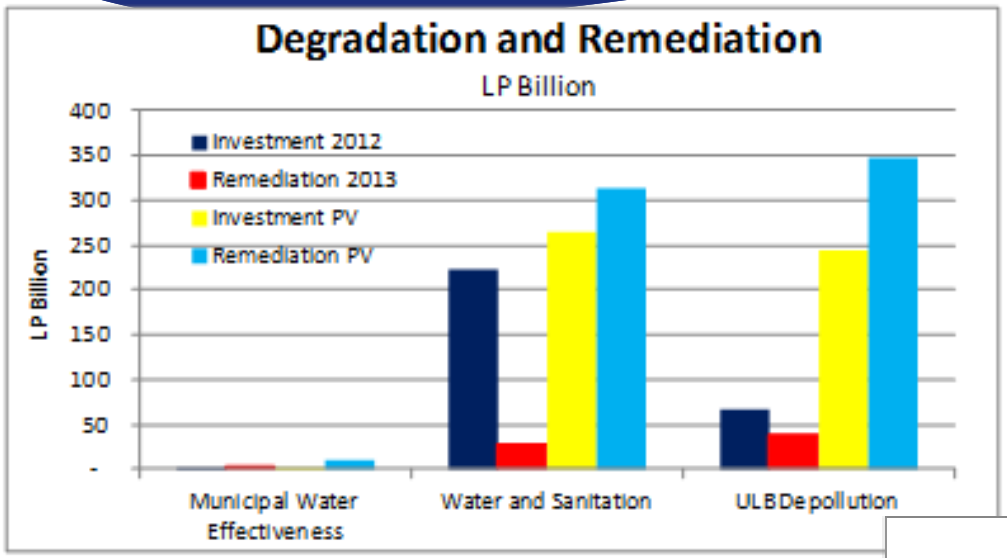
- Water and Sanitation: 100% of coverage and hygiene awareness.
- Water Network Efficiency.
- Depollution of the ULB based on the MOE/UNDP/ElArd Qaraoun depollution study.

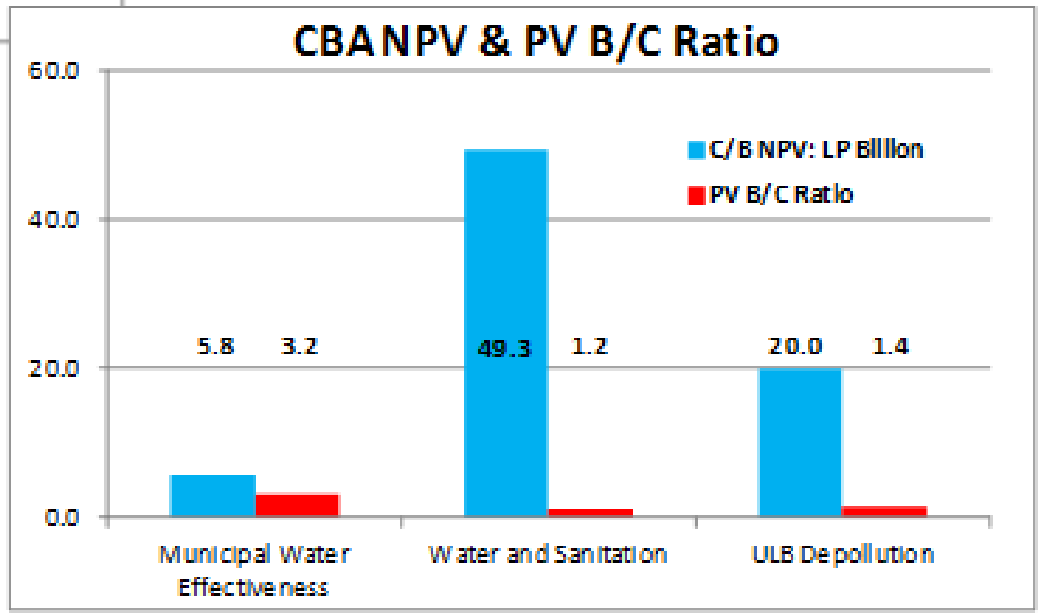
Remediation Cost: Aggregated Results

Cost of Remediation of the Litani, 2012 and LP billion

Litani	Investment 2012	Remediation 2013	NPV of Investment	NPV of Remediation
	LP Billion	LP Billion	LP Billion	LP Billion
Municipal Water Effectiveness	3	1	3	10
Water and Sanitation	223	28	265	314
ULB Depollution	68	38	243	347
Total	294	68	511	671

Remediation Cost: Aggregated Results





Remediation Cost 1: Water and Sanitation

The results of the 3 scenarios are as follows:

- Scenario 1 ensures an improved sanitation to 319,229 inhabitants in the ULB between 2013 and 2031 and is viable with a positive NPV of LP 53, an IRR of over 10% and the PV B/C ratio of more than 1.
- Scenario 2 ensures improved safe drinking water and sanitation to 504,385 inhabitants in the ULB between 2013 and 2031 and is not viable with a negative NPV of LP 3.8 billion.
- Scenario 3, which includes scenarios 1 and 2, the investment is viable with a positive NPV of LP 49.3 billion, an IRR of over 10% and a PV B/C ratio over 1.

Remediation Cost 1: Water and Sanitation

Investment cost range between LP 10 and 29 billion

Cost/Benefit Analysis of Improved Water and Sanitation on Health, 2012

CBA Indicators	Viability Criteria (10% Discount rate and 20 year investment)	Scenario 1 Sanitation and Hygiene Awareness over 20 years	Scenario 2 Water, Sanitation and Hygiene Awareness over 20 years	Scenario 3 Scenarios 1 and 2 over 20 years
NPV (LP Billion)	>0	53.0	-3.8	49.3
IRR (±%)	≥10%	23%	10%	13%
PV Benefit/Cost Ratio	>1	2.2	1.1	1.2
Project Viability		**Yes**	**No**	**Yes**

Remediation Cost 2: Network Technical Losses

Two scenarios were considered:

(i) the remediation costs are confronted to 5% of the incremental cost incurred by household to supply additional water (quality and quantity) and the incremental cost incurred are assumed constant over the 20 year investment; and

(ii) the remediation costs are confronted to the optimal incremental cost needed to cover the investment and could be considered as the switch off point above which the investment is no longer viable.

Remediation Cost 2: Network Technical Losses

The results of the 2 scenarios are as follows:

- **Scenario 1 is viable with a positive NPV of LP 5.8 billion, an IRR of 39% and the PV B/C ratio of 3.2.**
- **Scenario 2, which is considered the switch off point beyond which the investment is no longer viable, is profitable with a positive NPV of LP 0.1, an IRR of over 10% and the PV B/C ratio of more than 1.**

Cost/Benefit Analysis of Municipal Water Leakage Reduction, 2012, LP Billion

CBA Indicators	Viability Criteria (10% Discount rate and 20 year investment)	Scenario 1 5% of Household Incremental Spending over 20 years	Scenario 2 Household Optimal Incremental Spending over 20 years
NPV (LP Billion)	>0	5.8	0.1
IRR (±%)	≥10%	39%	10%
PV Benefit/Cost Ratio	>1	3.2	1.1
Project Viability		**Yes**	**Yes**

Remediation Cost 2: Network Technical Losses

- In retrospect, the 2 scenarios are profitable but the most salient point is that the cost of investment to reduce the 7.2 MCM leakage represents only 1.5% of the actual annual incremental cost already paid by households to supplement water for their domestic use.

Remediation Cost 3: Depollution of ULB

Two Scenarios are considered:

Scenario 1 being the combined cost of ongoing, planned and additional investments as reported by the Government/ Development Partners and MOE/UNDP/ElArd; and

Scenario 2 being Stand alone additional investments as suggested by MOE/UNDP/ElArd. In other words, the full benefits of Scenario 2 cannot materialize without the full implementation and operationalization of the Government/Development Partner ongoing and planned investments.

Remediation Cost 3: Depollution of ULB

- **MOE/UNDP/ElArd Investment costs are used.**

Remediation Cost of the Upper Litani Basin, 2012, in LP Billion

Proposed remediation	Investment 2012	Remediation 2016	Investment PV 2012-31	Remediation PV 2016-31
	LP Billion	LP Billion	LP Billion	LP Billion
Scenario 1: Combined cost of ongoing, planned and additional investments (Government/Development Partners and MOE/UNDP/ElArd)	171x3	29	611	920
Scenario 2: Stand alone additional investments (MOE/UNDP/ElArd)	68x3	38	243	347

Note: Investment amounts are equally distributed over 3 years. Operations and Maintenance are set at 5% of capital cost with an annual increase of 3%.

Remediation Cost 3: Depollution of ULB

There are a number of caveats such as: the existing infrastructure (waste processing and landfilling ; WWTP, sewers, etc.) is not accounted for; investments that are ongoing and not mentioned in 2011 MOE/UNDP/ElArd report are not considered such for instance the World Bank LEPAP; some discrepancies exist between the figures provided by CDR and the figures provided by the 2012 MOEW National Sanitation Strategy on the priority WWTPs and their capacity; financial rather economic costs are used in the analysis; the reduction of runoff was not properly costed in the MOE/UNDP/ElArd Qaraoun Depollution Study; etc.

Remediation Cost 3: Depollution of ULB

The aggregated ongoing, planned and additional investments amount to LP 513 billion with LP 309 billion already ongoing and planned by the Government/Development Partners and LP 204 billion as additional investments that will allow the ULB water resources parameters to be in line with international/national standards.

Remediation Cost 3: Depollution of ULB

The results of the 2 scenarios are as follows:

- Scenario 1's combined ongoing, planned and additional investments to bring ULB water parameters to acceptable standards is not viable with a negative NPV of LP 26 billion, an IRR of 9% and the PV B/C ratio of 1.2. Hence, a series of BCAs are needed to see the most efficient interventions among both the ongoing, planned and additional investments.
- Scenario 2's stand-alone additional investment as calculated by 2011 MOE/UNDP/ElArd is viable with a positive LP 20 billion, an IRR of 12% and the PV B/C ratio of 1.4. The positive result assumes that Government/ Development Partner ongoing and planned investments were implemented and are efficiently operated.

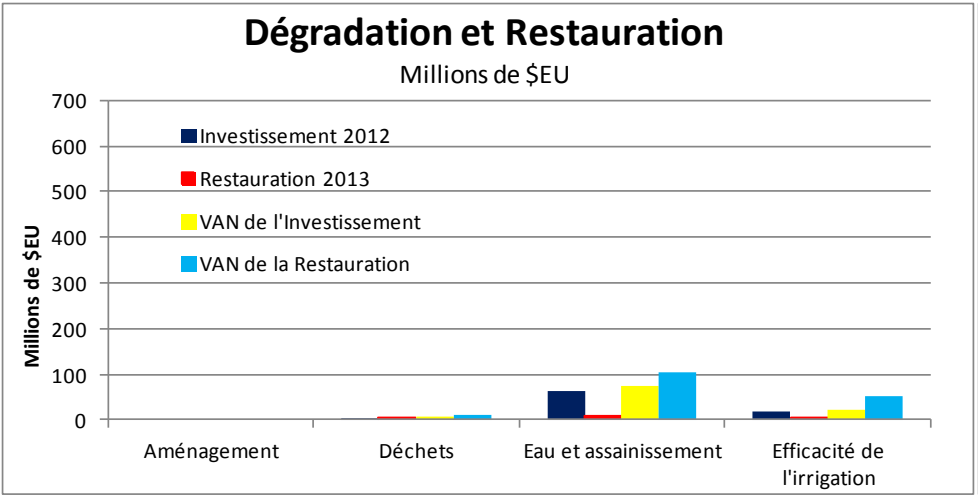
Remediation Cost 3: Depollution of ULB

Cost/Benefit Analysis of the Upper Litani Basin, 2012

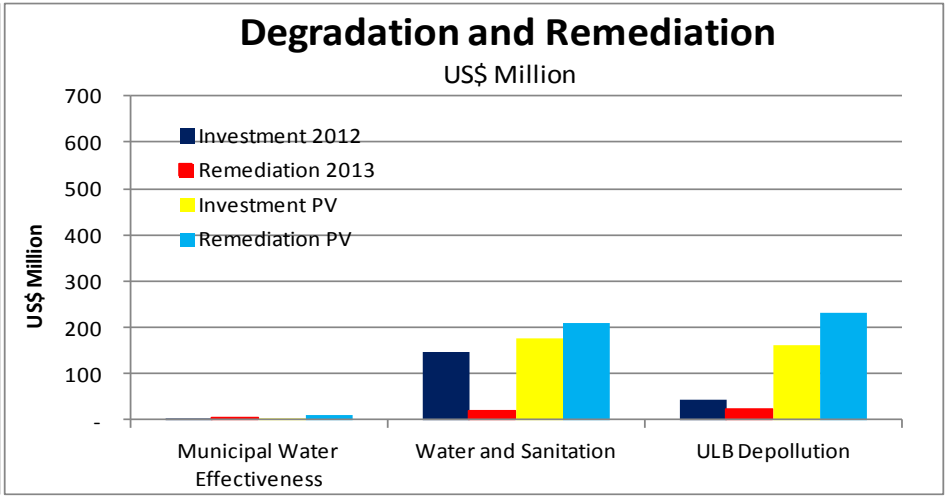
CBA Indicators	Viability Criteria (10% Discount rate and 20 year investment)	Scenario 1 Combined cost of ongoing, planned and additional investments Water Resources Parameters will reach Acceptable Standards from Accruing Benefits if Investments are efficiently managed	Scenario 2 Stand-alone additional investments that assumes that ongoing and planned investments were implemented and are efficiently operated
NPV (LP Billion)	>0	-26	20
IRR (±%)	≥10%	9%	12%
PV Benefit/Cost Ratio	>1	1.2	1.4
Project Viability		**No**	**Yes**

Final Note: Comparison by Basin

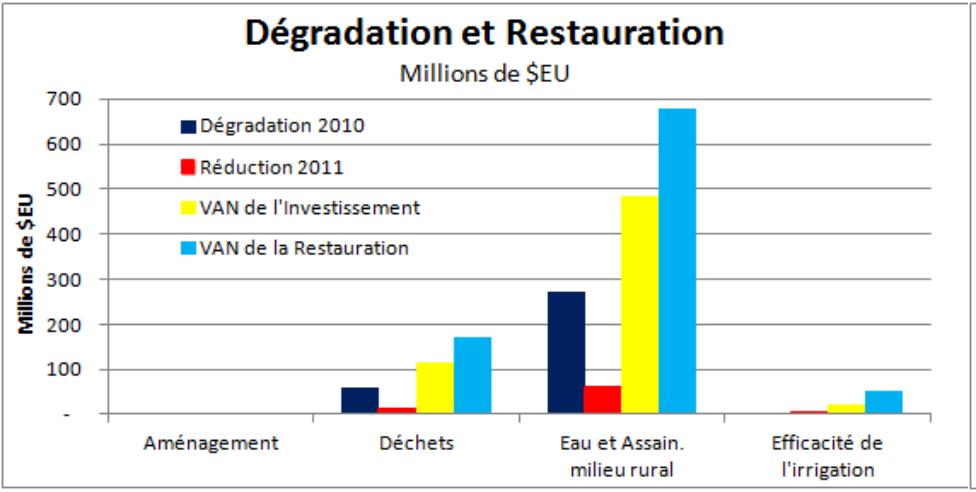
Algeria



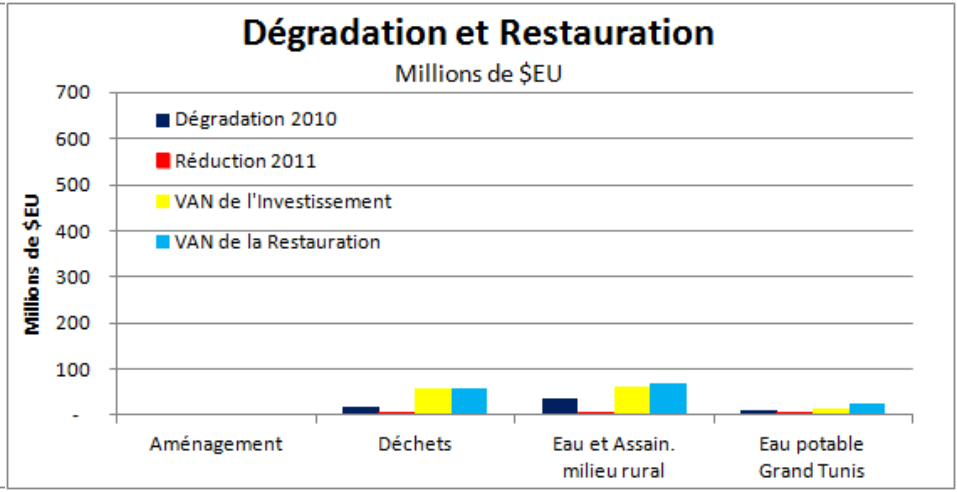
Lebanon



Morocco



Tunisia



مع خالص شكري وامتناني

Thank you for your attention

Merci pour votre attention

4th part: Discussion

For additional information please contact:
Sustainable Water Integrated Management - Support Mechanism: info@swim-sm.eu